

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 0 945 631 A2**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
29.09.1999 Bulletin 1999/39

(51) Int Cl.<sup>6</sup> **F16B 19/10**(21) Application number: **99302066.8**(22) Date of filing: **17.03.1999**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: **Kashimura, Shuji**  
**c/o Pop Rivets & Fasteners K.K**  
**Toyohashi-shi, Aichi-ken (JP)**

(74) Representative: **Shaya, Darrin Maurice et al**  
**Black & Decker,**  
**Patent Department,**  
**210 Bath Road**  
**Slough SL1 3YD (GB)**

(30) Priority: **23.03.1998 JP 7389398**

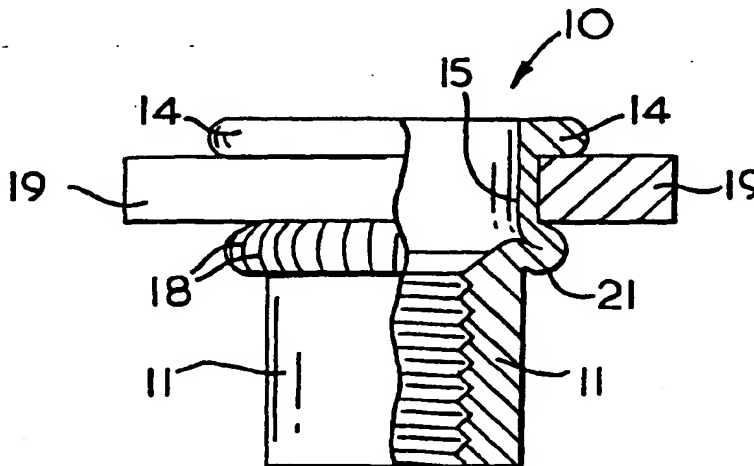
(71) Applicant: **EMHART INC.**  
**Newark, Delaware 19711 (US)**

**(54) Securing element**

(57) To provide a securing element such as a blind nut or rivet bolt wherein whitening is not produced on securing to a mounting member consisting of soft material, without forming a circumferential groove in the circumferential surface in the vicinity of the female threaded part of the tubular part.

Blind nut (10) comprises a female threaded part (11), a tubular part (13) continuous with the female threaded part, and a flange (14) formed at the end of the tubular part. The tubular part is secured to a mounting member in a condition with the tubular part inserted into a hole of the mounting member by buckling deformation

of the tubular part, by this portion that has been subjected to buckling deformation and the flange. Tubular part (13) comprises a cylindrical part (15) whose external diameter and internal diameter are practically uniform, and which is formed of smaller thickness than female threaded part (11), and a reduced-diameter part (17) formed between the cylindrical part and female threaded part such that there is a continuous reduction of the external diameter of the cylindrical part to the external diameter of the female threaded part, whereby the bending point of buckling is in a condition elevated from the mounting member.

**FIG. 4****EP 0 945 631 A2**

## Description

[0001] This invention relates to a blind nut-type securing element or rivet bolt type securing element made of metal capable of effecting securing to a mounting member such as a panel from one direction.

[0002] Metal blind nuts are well known comprising a female threaded part, a tubular part continuous with the female threaded part, and a flange formed at the end of the tubular part, such that this tubular part is secured to a mounting member by buckling deformation by this buckle deformation portion and flange, in a condition with the tubular part inserted into a hole of the mounting member, and are disclosed for example in Japanese Utility Model Publication No. Sho. 59-146607. The blind nuts are convenient for securing to members whose back cannot be reached, for example mounting members such as body panels, since the task can be performed from a single direction. The bolt can be screwed into a blind nut secured to the mounting member and, by screwing in this bolt, another member such as an ornamental member can be mounted on the mounting member.

[0003] An example of a rivet bolt type securing element is disclosed in Laid-Open Japanese Patent Publication No. Sho. 62-242112. Such a securing element comprises a tubular part, a flange formed at one end of the tubular part, and a mandrel whereof one end projects from the flange and whose other end is fixed to the other end of the tubular part, the construction being such that securing to the mounting member is effected by buckling deformation of the tubular part in a condition with the tubular part inserted into a hole of the mounting member, by means of the buckle deformation portion and the flange, the mandrel being formed with a male thread. The securing element can be secured so as to extend from one direction forwards on the mounting member such as a panel, standing upright on the mounting member after securing in the form of a bolt, so that a member such as an ornamental member can be mounted on the mounting member by screwing a nut thereonto from one direction.

[0004] In securing a securing element such as a blind nut, mounting can be effected by tight securing in the case where the mounting member is a hard material such as metal. However, when the mounting member is a soft material such as plastics, there is a risk of damaging the mounting member if the securing element is mounted by a strong tightening force. To deal with this, there are blind nuts which are so designed that securing can be effected even when the mounting member is a soft material such as plastics. An example of such is disclosed in Japanese Utility Model Publication H.3-13607. The tubular part of this blind nut is formed with longitudinal slits or grooves, so that, when securing, buckling can easily be produced thanks to the slit portions; thus, even if the mounting member is of soft material, the blind nut can be reliably secured without damaging the

mounting member such as a panel.

[0005] A prior art blind nut is described with reference to Fig. 1 and Fig. 2. Blind nut 1 comprises a female threaded part 2, a tubular part 3 continuous with female threaded part 2, and a flange 5 formed at the end of tubular part 3. As is well known, during the operation of tightening the blind nut 1, tubular part 3 is inserted into a mounting hole of a mounting member 6 such as a panel and female threaded part 2 is pulled upwards by means of a tightening tool or the like, in the condition with flange 5 in face contact with the mounting member. By means of this pulling up, as shown in Fig. 2, tubular part 3 is deformed in the radially outwards direction of the mounting hole so that it projects outwards at bending point 7, undergoing buckling deformation centred on this bending point. If, as in Japanese Utility Model Publication No. H.3-13607, longitudinal slits are formed in tubular part 3, buckling deformation can be achieved by a weak pulling-up force i.e. tightening force, so that, even if the mounting member is of soft material such as plastics, the blind nut can be securely tightened without damaging the mounting member.

[0006] However, even regarding blind nuts equipped with slits, some aspects require improvement. For example, if the mounting member is a thermoplastic plastics material (such as for example ABS or PP), this plastics portion turns white when the mounting member is subjected to pressure by the buckling portion. Japanese Patent Publication No. H.9-317743 discloses a blind nut that deals with this problem of whitening. This blind nut comprises a female threaded part, a tubular part continuous with this female threaded part, and a flange formed at the end of this tubular part, the tubular part being formed with slits extending in its longitudinal direction and a groove in the circumferential direction being formed in the circumferential face of the tubular part in the vicinity of the female threaded part. When the female threaded part is pulled up towards the flange, bending of the tubular part commences from the aforesaid circumferential groove portion, so that the bending point is offset from the intermediate position of Fig. 2 of the publication towards the female threaded part; as a result of this offset, the possibility of the buckled portion of the tubular part being pressed against the surface of the mounting member is eliminated and so there is no possibility of whitening of the thermoplastic plastics material being produced. Also, damage to the mounting member can be prevented since, even if the bolt is screwed firmly on to the blind nut, the buckled portion is deformed in such a way as to move away from the surface of the mounting member, so there is no possibility of its being pressed against it.

[0007] Thanks to the formation of the circumferential groove in the circumferential face in the vicinity of the female threaded part of the tubular part of the securing element such as a blind nut disclosed in Japanese Patent Application No. H.9-317743 referred to above, the problem of whitening is eliminated in the case where the

mounting member is of soft material. If the formation of this circumferential groove could be made unnecessary, the manufacture of a securing element whereby whitening was prevented could be further facilitated.

[0008] An object of the present invention is therefore to provide a securing element such as a blind nut or rivet bolt wherein whitening does not occur on securing on to a mounting member made of soft material, without forming a circumferential groove in the circumferential face in the vicinity of the female threaded part of the tubular part.

[0009] In order to achieve the above object, according to the first aspect of the invention, there is provided a blind nut comprising a female threaded part, a tubular part continuous with this female threaded part, and a flange formed at the end of this tubular part, constituted such that, in a condition with the tubular part inserted into a hole in a mounting member, securing to the mounting member is effected by buckling deformation of this tubular part, by means of this portion that has been subjected to buckling deformation, and the flange, wherein: the tubular part comprises a cylindrical part whose external diameter is formed larger than the external diameter of the female threaded part and whose external diameter and internal diameter are practically uniform and which is formed with smaller thickness than the female threaded part, and a reduced-diameter part formed between the cylindrical part and female threaded part such that the external diameter of this cylindrical part reduces continuously to the external diameter of the female threaded part.

[0010] With a blind nut as described above, when the female threaded part is pulled up towards the flange, the cylindrical part of the tubular part commences bending offset to the reduced-diameter part on the side furthest from the flange that is in contact with the mounting member, and, whilst buckling is taking place in the radially outwards direction from the mounting hole of the mounting member, the bending point of the buckling in the final stage of this securing operation is at a position elevated from (i.e. not contacting) the mounting member, so there is no possibility of the buckled portion at this bending point being pressed against the mounting member, and, consequently, there is no possibility of whitening of a mounting member constituted by soft material occurring. Also, even if the bolt is screwed firmly on to the blind nut, since the portion of the bending point is in a position away from the surface of the mounting member, so that excess tightening force is not applied to the mounting member, damage to a mounting member consisting of soft material can be prevented. In this way, whitening can be avoided and damage to the mounting member can be prevented without the formation of a circumferential groove in the circumferential surface of the vicinity of the female threaded part of the tubular part.

[0011] According to this aspect of the invention, preferably knurled grooves may be formed in the face of the cylindrical part of the blind nut where it contacts the

mounting member. Also, projections may be formed in the face of the flange or cylindrical part where it contacts the mounting member. By means of such knurled grooves or projections, slippage of the blind nut with respect to the mounting member is stopped and rotation of the blind nut when the bolt is tightened can be prevented. Furthermore, it is desirable to form a slit in the cylindrical part from the flange to the reduced-diameter part. Buckling deformation of the cylindrical part is thereby facilitated.

[0012] According to a further aspect of the invention there may be provided a securing element comprising a tubular part, a flange formed at one end of this tubular part, and from the flange while its other end is fixed to the other end of the tubular part, constituted such that, in a condition with the tubular part inserted into a hole of the mounting member, by buckling deformation of the tubular part, securing on to the mounting member is effected by means of this portion that has been subjected to buckling deformation and the flange; wherein: the tubular part comprises a cylindrical part where buckling deformation takes place and a bolt fixing part fixed to the other end of the bolt, the cylindrical part being formed of larger diameter than the external diameter of the bolt fixing part and of smaller thickness, and a reduced-diameter part being provided formed such that the external diameter of the cylindrical part reduces continuously to the external diameter of the bolt fixing part, between the bolt fixing part and the cylindrical part. With this securing element also, by pulling the bolt up using a tightening tool or the like such that it extends beyond the flange, the cylindrical part of the tubular part starts to bend offset to the reduced-diameter part on the side furthest from the flange that contacts the mounting member, so the bending point of buckling is in a position elevated from the mounting member and the buckled portion therefore cannot press against the mounting member. As a result, whitening of a mounting member made of soft material cannot occur and even if the nut is strongly screwed on to the bolt of the securing element after securing, since the portion of the bending point is in a position away from the surface of the mounting member, the tightening force on to the mounting member does not become excessive, so damage to a mounting member made of soft material can be prevented.

[0013] It should be noted that in the case of a securing element as described also, knurled grooves may be formed in the surface of the cylindrical part where it is in contact with the mounting member, and projections may be provided in the face of the flange or cylindrical part where it contacts the mounting member. Furthermore, in order to facilitate buckling deformation of the cylindrical part, a slit may be formed in the cylindrical part from the flange to the reduced-diameter part.

[0014] Embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings, of which:

Figure 1 shows a front view, with half broken away, of a prior art blind nut;

Figure 2 shows a front view, with half broken away, showing how buckling deformation of the blind nut of Fig. 1 occurs;

Figure 3 shows a front view, with half broken away, of a blind nut according to a first embodiment of the invention;

Figure 4 shows a front view, with half broken away, showing how the blind nut of Fig. 3 constituting a first embodiment of the invention is secured to a mounting member;

Figure 5 shows a front view, with half broken away, of a blind nut according to a second embodiment of the invention;

Figure 6 shows a front view, with half broken away, of a rivet bolt-type securing element according to a third embodiment of the invention; and

Figure 7 shows a front view, with half broken away, showing how the securing element of Fig. 6 constituting a third embodiment of the invention is secured to a mounting member.

**[0015]** Embodiments of the invention are described below with reference to the drawings. Fig. 3 and Fig. 4 show a blind nut (10) constituting a securing element according to a first embodiment of the invention. In Fig. 3, blind nut (10) is constituted by an integral metal moulding, the whole being formed as a hollow cylindrical body. Blind nut (10) comprises a female threaded part (11), a tubular part (13) thinner than female threaded part (11) and continuing so as to extend upwards from female threaded part (11), and a larger-diameter flange (14) formed at the end of tubular part (13). Tubular part (13) comprises a cylindrical part (15) extending downwards from flange (14) and a reduced-diameter part (17) formed for a short distance between this cylindrical part (15) and female threaded part (11).

**[0016]** Cylindrical part (15) is formed of larger external diameter than female threaded part (11), and is formed thinner than the female threaded part and with practically uniform external and internal diameters. Reduced-diameter part (17) is formed so as to gradually decrease in diameter and such that the outer diameter of cylindrical part (15) is continuous with the outer diameter of female threaded part (11).

**[0017]** The cylindrical part (15) of tubular part (13) is formed thinner than female threaded part (11) and is capable of buckling deformation so as to project radially outwards when, in a condition with this inserted into a hole of a mounting member such as a body panel, and flange (14) making face contact with the mounting member, female threaded part (11) is strongly pulled up towards flange (14) by means of a tightening tool etc. Also, since reduced-diameter part (17) gradually reduces in diameter such that the outer diameter of cylindrical part (15) becomes the outer diameter of the female threaded part (11), it constitutes a starting point for the buckling

deformation of cylindrical part (15). Consequently, the cylindrical deformation of cylindrical part (15) commences with deformation offset to the reduced-diameter part (17).

**[0018]** In the embodiment shown in Fig. 3 and Fig. 4, knurled grooves (18) are formed in the circumferential surface of cylindrical part (15). These knurled grooves (18) are effective in ensuring that the bolt screws into the female threaded part (11) by reliably preventing slippage of the blind nut (10) with respect to the mounting member as a result of the rotational force of the bolt when clamping is effected by screwing the bolt into the female threaded part (11) after securing blind nut (10) in the mounting member such as a panel. For the same reason, it is preferable to form slippage-preventing projections on the face of the cylindrical part (15) or flange (14) that contacts the mounting member. Although not shown, these projections may be of various shapes, such as pin shape or projecting rib shape.

**[0019]** Fig. 4 shows the condition of blind nut (10) after tightening. Blind nut (10) is held by screwing female threaded part (11) on to the screw-threaded mandrel of a tightening tool (not shown). Next, flange (14) is pressed on to the outside face of mounting member (19) by inserting female threaded part (11) and tubular part (13) of blind nut (10) held on the screw-threaded mandrel into a mounting hole of mounting member (19) such as a body panel, using the tightening tool. In this condition, female threaded part (11) is pulled up by operating the tightening tool to pull up the screw-threaded mandrel. By means of this pulling up, force is applied to the cylindrical part (15) and reduced-diameter part (17) of tubular part (13), producing deformation such as to cause this portion to project in the radially outwards direction. As mentioned above, the commencement of this deformation is effected from reduced-diameter part (17) on the side furthest from the flange (14). This is believed to be because the deformation stress is initially concentrated in reduced-diameter part (17) where the external diameter of cylindrical part (15) is gradually reduced. Consequently, cylindrical part (15) starts to bend from the reduced-diameter part and subsequently continues to buckle outwards in the radial direction from the mounting hole of mounting member (19), with this buckling deformation offset to reduced-diameter part (17).

**[0020]** By means of flange (14) and the buckled portion of the cylindrical part, blind nut (10) thus clamps mounting member (19) from both sides. By means of this clamping, blind nut (10) is secured on to the mounting member. At the end of this securing process, the root portion of the buckled portion of cylindrical part (15) strongly clamps mounting member (19). However, as shown in Fig. 4, the bending point (21) of the buckled portion of the cylindrical part (15) is in a position separated from (i.e. not contacting) mounting member (19). There is therefore no possibility of the buckled portion at bending point (21) being pressed against the mounting member. Consequently, even when the mounting

member is of soft material, there is no possibility of whitening of this soft mounting member occurring. Also, even if the bolt is screwed firmly on to this blind nut (10) after blind nut (10) has been secured to the mounting member, since the portion of bending point (21) is in a position in which it is separated from the back face of mounting member (19), the tightening force on to mounting member (19) does not become excessive and, as a result, even if mounting member (19) is of soft material, damage to the mounting member can be prevented. In this way, whitening can be avoided and damage to the mounting member can be prevented without forming a circumferential groove in the circumferential surface of the tubular part in the vicinity of the female threaded part.

[0021] Furthermore, thanks to the formation of knurled grooves (18) in cylindrical part (15) of blind nut (10), the region of these knurled grooves (18) bites into the side wall or the rim surface on the underside of mounting member (19) due to buckling of cylindrical part (15), thereby preventing rotation of blind nut (10) when this is tightened; thus, slippage of blind nut (10) with respect to the mounting member due to the rotational force of the bolt if this is screwed into blind nut (10) after tightening is reliably prevented, enabling the bolt to be reliably screwed into female threaded part (11). The same effect can be obtained by the provision of slippage-preventing projections in the face of cylindrical part (15) or flange (14) that contacts the mounting member. In this way, blind nut (10) shown in Fig. 3 and Fig. 4 is reliably secured on to mounting member (19) and the problem of whitening occurring on tightening is eliminated; furthermore, even if the bolt is screwed into the blind nut after securing, there is little damage to a soft mounting member and slippage on screwing in can also be prevented.

[0022] Fig. 5 shows a blind nut (22) according to a second embodiment of the invention. This blind nut (22) is practically identical with blind nut (10) of Fig. 3 and Fig. 4 but is formed with a slit (23) in the cylindrical part. Specifically, as a whole, blind nut (22) consists of an integrally formed hollow metal moulding, comprising a female threaded part (11), a tubular part (13) that is thinner than female threaded part (11) and continues extending upwards from female threaded part (11), and a flange (14) of large diameter formed at the end of tubular part (13). Tubular part (13) comprises a cylindrical part (15) extending below flange (14), and a reduced-diameter part (17) formed for a short distance between this tubular part (15) and female threaded part (11). Reduced-diameter part (17) is formed with gradually reduced diameter such that the outer diameter of cylindrical part (15) is continuous with the outer diameter of female threaded part (11). In order to promote buckling deformation of cylindrical part (15), blind nut (22) is further formed with four slits (23) extending in the longitudinal direction and provided at intervals of 90° in the circumferential surface direction. The number of these slits (23)

is of course not limited to four but could be any desired number. Thus, thanks to the provision of slits (23), buckling deformation of cylindrical part (15) can be performed with a weak upward pulling force i.e. tightening force, facilitating the operation of tightening and reducing further the possibility of damage to a soft mounting member. It should be noted that the shape of blind nut (22) after tightening is the same as that of Fig. 4 apart from the fact that cylindrical part (15) is divided at the locations of slits (23).

[0023] Fig. 6 and Fig. 7 show a rivet bolt type securing element (25) constituting a securing element according to a third embodiment of the invention.

[0024] In Fig. 6, securing element (25) comprises a tubular part (26), a flange (27) formed at one end (top end) of tubular part (26), and a bolt (31) that passes through the interior of tubular part (26) and whereof one end (the upper end in the Figure) 29 projects from flange (27) and the other end (the lower end in the Figure) 30 is fixed to the other end (lower end) of tubular part (26). At the other end (30) of bolt (31) there is formed a larger-diameter head (33) of larger diameter than the external diameter of tubular part (26), such that buckling deformation of tubular part (26) is reliably achieved by pulling up bolt (31). Tubular part (26) comprises a cylindrical part (34) arranged adjacent flange (27), which constitutes the main buckle deformation portion, a bolt fixing part (35) fixed to the other end (lower end) (30) of bolt (31), and a reduced-diameter part (37) formed between cylindrical part (34) and bolt fixing part (35).

[0025] Cylindrical part (34) is formed of cylindrical shape surrounding bolt (31), being formed with external diameter larger than the external diameter of bolt fixing part (35) and being formed with small thickness so as to be capable of buckling deformation. Reduced-diameter part (37) is formed such that the outer diameter of larger-diameter cylindrical part (34) is continuous with and reduces to the external diameter of bolt fixing part (35), which is of smaller diameter, and is formed thinner than bolt fixing part (35). Bolt fixing part (35) is fixed to the other end (30) of bolt (31) by welding or caulking etc. Preferably a circumferential groove (38) and/or knurled groove (39) are formed at the other end (30) of the bolt in order that bolt (31) should not become detached from tubular part (26) and should be fixed so that it cannot rotate. Bolt (31) is formed with a male thread from a position corresponding to tubular part (26) as far as a position extended by a certain length beyond flange (27). The one end i.e. the upper portion (29) of bolt (31), in the example illustrated, was formed with short length. In the case of the example illustrated, buckling deformation of cylindrical part (34) of tubular part (26) is effected by pulling up bolt (31) by threading on to the male screw-thread a nut member provided at the nose of a tightening tool and then rotating this. Portion (29) above the male thread of bolt (31) could be formed longer and with a small-diameter "broken-neck" part as shown in Laid-Open Patent Publication Sho. 62-242112. In this case,

buckling deformation of cylindrical part (34) of tubular part (26) is effected by operation such as to engage a gripper of a tightening tool with the upper end portion (29) of the bolt and pulling up the gripper until the bolt is broken off at the small-diameter broken-neck part (not shown).

[0026] The condition after tightening securing element (25) is shown in Fig. 7. Securing element (5) is held by threading a nut member of a tightening tool (not shown) on to the male thread of bolt (31) and, using the tightening tool, the tubular part (26) of securing element (25) is inserted into a mounting hole of mounting member (19), flange (27) being pressed against the outer surface of mounting member (19). In this condition, force such as to produce deformation such as to cause this portion to project in the radially outwards direction is applied to cylindrical part (34) and reduced-diameter part (37) of tubular part (26) by pulling up bolt (31) by rotating the nut member, by operating the tightening tool. Commencement of this deformation is effected from the reduced-diameter part (37) furthest from flange (27), just as in the case of blind nut (10). Bending of cylindrical part (34) therefore commences from reduced-diameter part (37) and subsequently buckling deformation continues in the radially outwards direction from the mounting hole of mounting member (19), offset towards reduced-diameter part (37).

[0027] Securing element (25) is secured to the mounting member by clamping mounting member (19) from both sides by means of flange (27) and the buckled portion of cylindrical part (34). As shown in Fig. 7, the bending point (41) of the buckled portion of cylindrical part (34) is in a position elevated from (i.e. not contacting) mounting member (19), so there is no possibility of the buckled portion pressing against the mounting member at bending point (41). Consequently, when the mounting member is made of soft material, whitening of this soft mounting member cannot occur. Also, even if the nut is strongly screwed on to securing element (25) after securing element (25) has been secured to the mounting member, since the portion of the bending point (41) is in a position away from the back face of mounting member (19), the tightening force on to mounting member (19) does not become excessively strong and as a result even if the mounting member (19) is made of soft material, damage to the mounting member can be prevented. In this way, whitening can be avoided and damage to the mounting member can be prevented without forming a circumferential groove in the circumferential surface in the vicinity of the female threaded part of the tubular part

[0028] It should be noted that, since knurled grooves (42) are formed in cylindrical part (34) also in the case of securing element (25), the portion of these knurled grooves (42) bites into the side wall or under-surface rim face of the mounting hole of the mounting member (19) on buckling of the cylindrical part (34), thereby preventing rotation of securing element (25) within the mounting

hole and enabling slippage of securing element (25) with respect to the mounting member due to rotational force of the nut when this is screwed on to securing element (25) after tightening to be reliably prevented; thus the nut can be threaded on to bolt (31) in a secure fashion. It is also desirable to form slippage-preventing projections on the surface of cylindrical part (34) or flange (27) where this contacts the mounting member. Buckling deformation may be further facilitated by forming slits in the cylindrical part (34) from flange (27) as far as the reduced-diameter part (37).

[0029] With a blind nut according to the invention, since a reduced-diameter part is provided that effects connection whilst reducing in diameter between the female threaded part and the cylindrical part of larger diameter than the female threaded part, bending commences offset towards the reduced diameter part, and, whilst buckling takes place in the radially outwards direction from the mounting hole of the mounting member, the bending point of the buckling in the last stage of tightening is in a position elevated from (i.e. not contacting) the mounting member, so there is no possibility of the buckled portion at this bending point being pressed against the mounting member and as a result there is no possibility of whitening of a mounting member made of soft material occurring. Also, even if the bolt is screwed strongly on to the blind nut, since the tightening force applied to the mounting member cannot become excessively large because the portion of the bending point is in a position away from the surface of the mounting member, damage to a mounting member made of soft material can be prevented. In this way, whitening can be avoided and damage to the mounting member can also be prevented without forming a circumferential groove in the circumferential surface in the vicinity of the female threaded part of the tubular part.

[0030] Since, with a rivet bolt type securing element according to the invention, the tubular part is provided with a reduced-diameter part that reduces in diameter such that the outer diameter of the cylindrical part is continuous with the outer diameter of that the outer diameter of the cylindrical part is continuous with the outer diameter of the bolt fixing part between the cylindrical part which is formed of small thickness so as to permit buckling deformation and the bolt fixing part where the bolt is fixed, when the bolt is pulled upwards using the tightening tool or the like so as to cause it to extend beyond the flange, bending of the cylindrical part commences offset towards the reduced-diameter part; thus, the bending point of buckling is in a position elevated from the mounting member, so there is no possibility of the buckling portion being pressed against the mounting member; consequently, whitening of a mounting member made of soft material cannot occur and even if the nut is screwed firmly on to the bolt of the securing element after securing, damage to a mounting member of soft material can be prevented.

## Claims

1. A blind nut comprising a female threaded part (11), a tubular part (13) continuous with the female threaded part (11), and a flange (14) formed at the end of this tubular part (13), constituted such that, in a condition with the tubular part (13) inserted into a hole in a mounting member (19), securing to the mounting member (19) is effected by buckling deformation of the tubular part (13), by means of this portion that has been subjected to buckling deformation, and the flange (14), wherein:  
the tubular part (13) comprises a cylindrical part (15) whose external diameter is formed larger than the external diameter of the female threaded part (11) and whose external diameter and internal diameter are practically uniform and which is formed with smaller thickness than the female threaded part, and a reduced-diameter part (17) formed between the cylindrical part (15) and female threaded part (11) such that the external diameter of this cylindrical part (15) reduces continuously to the external diameter of the female threaded part (11).
2. A blind nut according to claim 1 wherein knurled grooves (11) are formed on the face of the cylindrical part where it contacts the mounting member (19).
3. A blind nut according to claim 1 or claim 2 wherein projections are formed in the surface of the cylindrical part (15) or the flange (5) where it contacts the mounting member (19).
4. A blind nut according to any of claims 1 - 3 wherein a slit is formed in the cylindrical part (15) from the flange to the reduced-diameter part (17).
5. A securing element comprising a tubular part (26), a flange (27) formed at one end of this tubular part, and a bolt (31) passing through the interior of the tubular part and whereof one end (29) projects from the flange (27) while its other end (30) is fixed to the other end of the tubular part, constituted such that, in a condition with the tubular part inserted into a hole of the mounting member, by buckling deformation of the tubular part, securing on to the mounting member is effected by means of this portion that has been subjected to buckling deformation and the flange; wherein:  
the tubular part comprises a cylindrical part (15) where buckling deformation takes place and a bolt fixing part fixed to the other end of the bolt, the cylindrical part being formed of larger diameter than the external diameter of the bolt fixing part and of smaller thickness, and a reduced-diameter part being provided formed such that the external diameter of the cylindrical part reduces continuously to the external diameter of the bolt fixing part, between the bolt fixing part and the cylindrical part.
6. A securing element according to claim 5 wherein knurled grooves (42) are formed on the face of the cylindrical part where it contacts the mounting member.
7. A securing element according to claim 5 or claim 6 wherein projections are formed on a face of the flange or the cylindrical part where it contacts the mounting member.
8. A securing element according to any one of claims 5 - 7 wherein a slit is formed in the cylindrical part from the flange to the reduced-diameter part.

FIG. 1

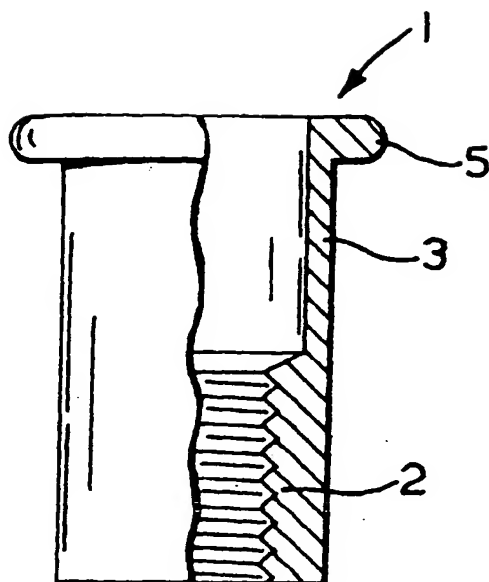
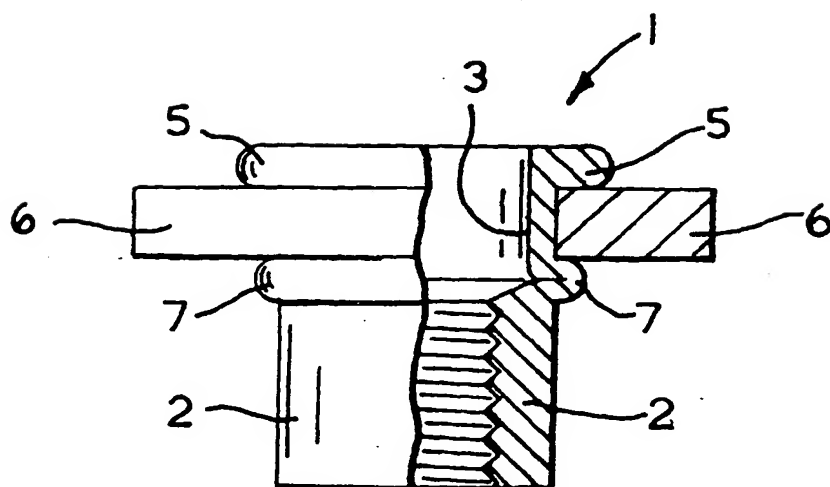


FIG. 2





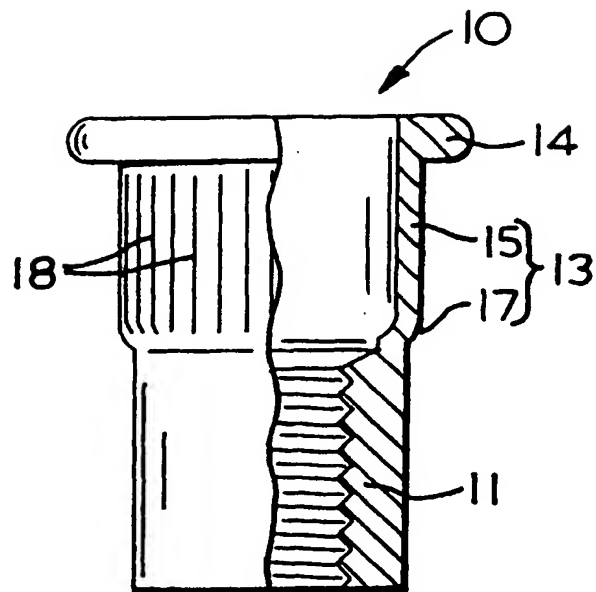


FIG. 3

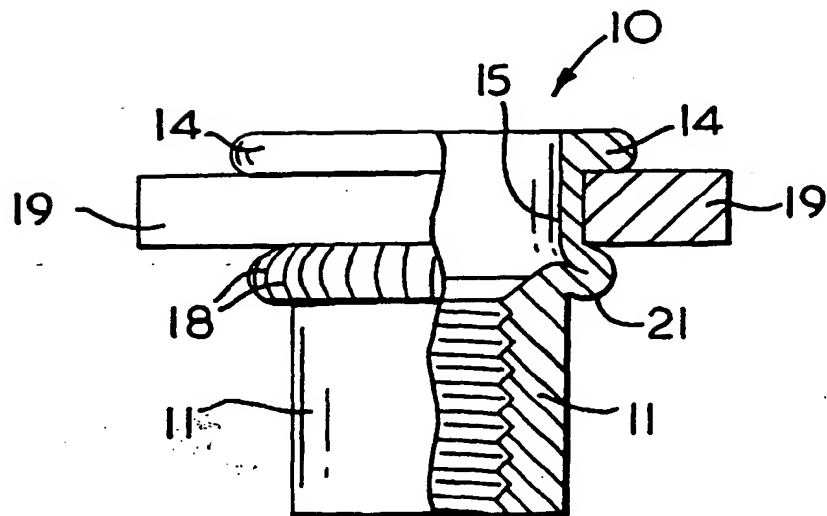


FIG. 4

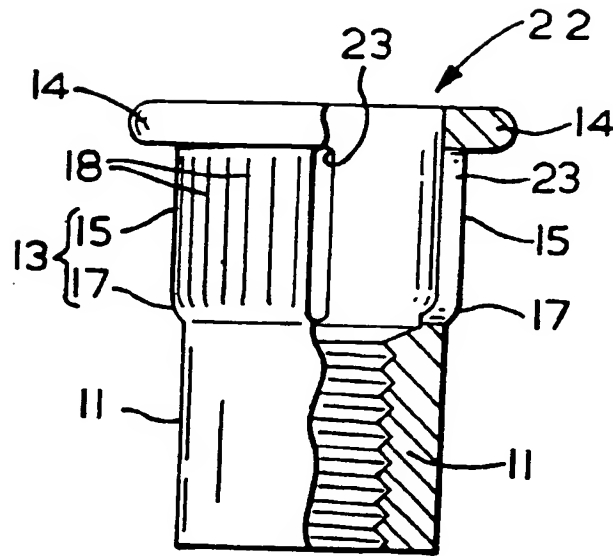


FIG. 5

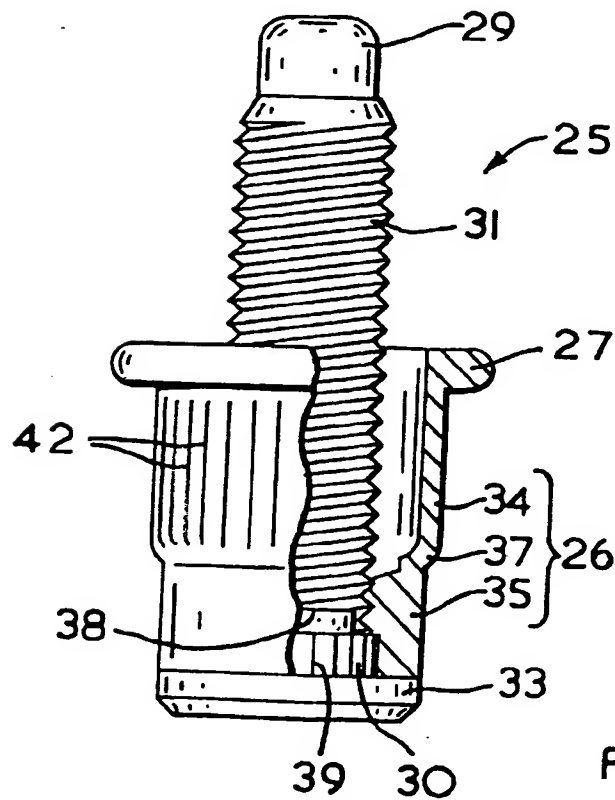


FIG. 6

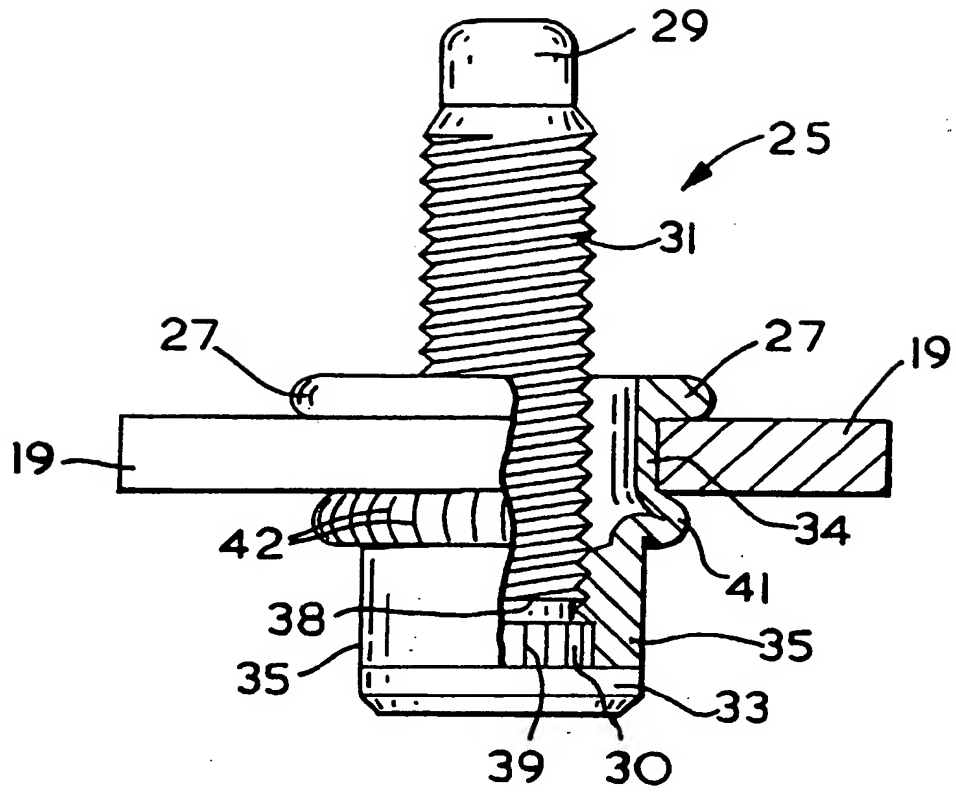


FIG.7

**THIS PAGE BLANK (USPTO)**

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 945 631 A3

(12)

## EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
19.07.2000 Bulletin 2000/29

(51) Int Cl.7: F16B 19/10

(43) Date of publication A2:  
29.09.1999 Bulletin 1999/39

(21) Application number: 99302066.8

(22) Date of filing: 17.03.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(72) Inventor: Kashimura, Shuji  
c/o Pop Rivets & Fasteners K.K  
Toyohashi-shi, Aichi-ken (JP)

(30) Priority: 23.03.1998 JP 7389398

(74) Representative: Shaya, Darrin Maurice et al  
Black & Decker,  
Patent Department,  
210 Bath Road  
Slough SL1 3YD (GB)

(71) Applicant: EMHART INC.  
Newark, Delaware 19711 (US)

## (54) Securing element

(57) To provide a securing element such as a blind nut or rivet bolt wherein whitening is not produced on securing to a mounting member consisting of soft material, without forming a circumferential groove in the circumferential surface in the vicinity of the female threaded part of the tubular part.

Blind nut (10) comprises a female threaded part (11), a tubular part (13) continuous with the female threaded part, and a flange (14) formed at the end of the tubular part. The tubular part is secured to a mounting member in a condition with the tubular part inserted into a hole of the mounting member by buckling deformation

of the tubular part, by this portion that has been subjected to buckling deformation and the flange. Tubular part (13) comprises a cylindrical part (15) whose external diameter and internal diameter are practically uniform, and which is formed of smaller thickness than female threaded part (11), and a reduced-diameter part (17) formed between the cylindrical part and female threaded part such that there is a continuous reduction of the external diameter of the cylindrical part to the external diameter of the female threaded part, whereby the bending point of buckling is in a condition elevated from the mounting member.

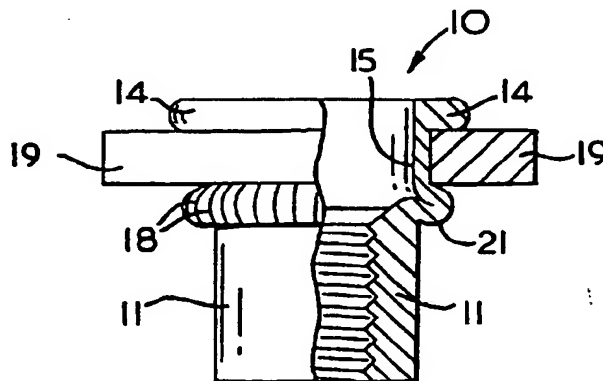


FIG. 4

EP 0 945 631 A3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 2066

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 595 041 A (BÖLLHOFF & CO) 4 May 1994 (1994-05-04) * abstract *	1,5	F16B19/10
Y	* column 6, line 6 - line 41 * * column 7, line 6 - column 8, line 26; claim 1; figures 4-9 *	2-4,6-8	
Y	EP 0 077 858 A (SIMAF) 4 May 1983 (1983-05-04) * claims 1-5; figure 1 *	2,3,6,7	
D,Y	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 04, 31 March 1998 (1998-03-31) - & JP 09 317743 A (POP RIVET FASTENER KK), 9 December 1997 (1997-12-09) * abstract *	4,8	
X	FR 2 700 817 A (OTALU S.A.) 29 July 1994 (1994-07-29) * claims 1,2; figures 1,2 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F16B
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>15 May 2000</b>	Examiner <b>Granger, H</b>
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 2066

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-05-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0595041 A	04-05-1994	DE 4232535 A FR 2700817 A DE 9218740 U	31-03-1994 29-07-1994 30-03-1995
EP 0077858 A	04-05-1983	FR 2515283 A	29-04-1983
JP 09317743 A	09-12-1997	NONE	
FR 2700817 A	29-07-1994	EP 0595041 A	04-05-1994

EPO FORM P449

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**THIS PAGE BLANK (USPTO)**